



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460**

**OFFICE OF PREVENTION,
PESTICIDES AND TOXIC SUBSTANCES**

MEMORANDUM

FROM: David Farrar, Statistician, Terbufos RED task leader
James Breithaupt, Agronomist
Environmental Fate and Effects Division (7507C)

THRU: Pat Jennings, Acting Branch Chief
Environmental Risk Branch II
Environmental Fate and Effects Division (7507C)

TO: Pam Noyes, Chemical Review Manager
Special Review and Reregistration Division

SUBJECT: **Terbufos:** Responses to Comments from American Cyanamid Co.
submitted Feb. 16, 1999; Updated characterization of Terbufos aquatic incidents

DP BARCODE: D253363

DATE: Aug. 20, 1999

The purpose of this communication is to respond to comments submitted by American Cyanamid Co. on Feb. 16, 1999. Concurrently but in a separate communication EFED is providing a RED chapter revised to address comments from Cyanamid, as well as other comments and information received recently by EFED.

Issues raised by Cyanamid include the significance of 'farm pond' incidents (in practice, usually fish kills), the interpretation of terrestrial risk quotients, and availability of an avian field study not considered in the draft chapter (11/4/98) that Cyanamid reviewed. In responding to Cyanamid's comments on aquatic incidents, we find it useful to synthesize EFED's previous communications on issues related to aquatic incidents.

Characterization of Terbufos aquatic incidents. Previous communications from EFED related to aquatic incidents include a 4/11/99 memo discussing the significance of reported incidents. After the 4/11/99 communication EFED responded to material submitted to the docket by Martha Philbeck, whose pond was damaged by Terbufos applied on neighboring property, as were ponds owned by two neighbors of the Philbecks. Each of these communications has been placed in the Terbufos document.

The 4/11/99 communication includes the following points related to Terbufos incidents:

- For each reported incident there was some evidence to associate the incident with use on corn. Eighty percent of incidents occurred in five corn belt states (IA, IN, IL, NE, OH).
- Terbufos ranks fourth among all pesticides in number of incidents reported to the Agency, and first for incidents related to use on corn;
- EFED believes that incidents involving farm ponds are significant for reasons that include (1) the value of managed fish in the farm ponds; (2) the value of natural populations that farm ponds support (e.g., with breeding habitat, food, or water); and (3) the value of farm pond incidents as indicators of impacts on other surface water. Each of these points is discussed in detail in the 4/11/99 memo.
- Incidents reported annually ranged from 1 in 1996 to 18 in 1990. The average rate of incidents is 8 per year. The numbers of incidents per year are tabulated in the 4/11/99 memo, as well as in the recently revised RED chapter.
- The number fish killed in particular incidents ranged up to 90,000.
- All application methods for corn (band, t-band, and in furrow) caused incidents.
- Both 15G and 20CR formulations caused incidents.
- Large grassy buffer strips (350-1000 feet) did not prevent incidents in some cases.
- Incidents generally occurred from 2 days to 3 weeks after application.

Cyanamid maintains that the record of aquatic incidents demonstrates that a special series of events must occur in order for an incident to occur. However, the documentation provided is not adequate to support a position that the circumstances surrounding aquatic incidents are so peculiar that they will occur with negligible frequency. This applies in particular to the role of heavy rainfall, as discussed in greater detail below. Statements that incidents occur on highly erodible soils or soil with high runoff potential also have not been adequately documented.

Cyanamid performs calculations which attempt to quantify the rate of incidents relative to the number of acres treated with Terbufos. EFED does not agree that these types of calculation are meaningful. This type of approach treats the reported incidents as if they account completely for the adverse aquatic effects that actually occur in the field. EFED treats the reported incidents as a "sample" of the actual adverse effects due to a pesticide: *Reported* farm pond incidents are a sample of *actual* farm pond incidents. In addition to farm pond incidents (reported or otherwise), we expect that adverse effects occur in surface water other than farm ponds, but are detected and reported less frequently than incidents in farm ponds.

(The EFED team wishes to acknowledge the assistance of David Brassard of the Biological and Economic Analysis Division, who developed a summary of the Terbufos incidents that is still the basis of EFED's characterization, while detailing in EFED.)

The "Philbeck," "Bright," and "Anders" incidents (Indiana). Subsequent to EFED's 4/11/99 discussion, EFED and other OPP staff reviewed additional information on 3 incidents in Indiana, on the property of the Philbecks and on property of two neighbors of the Philbecks (the Anders and the Brights). These incidents appear to have been reported to the Agency by Cyanamid under FIFRA 6(a)(2) (Adverse Effects Reporting Requirements). These incidents provide additional useful perspectives on incidents caused by Terbufos.

The incidents occurred in June 1998 and have been attributed to T-band applications of Counter 20CR by the same applicator during May 1998. These incidents were investigated by the state of Indiana and no indications of misuse could be identified. For the Philbeck incident, tests conducted by Cyanamid found residues of Terbufos metabolites (Terbufos sulfone and Terbufos sulfoxide) in tests conducted on July 9 and August 5. Residues could not be detected in a test on August 25. For the incidents on the Anders property and the Bright property, only parent Terbufos was tested for by the state. Parent Terbufos was not detected. However, it is known that parent Terbufos degrades rapidly to form the sulfoxide and sulfone metabolites, which are more mobile and persistent than parent Terbufos. Therefore the lack of detections for parent Terbufos does not provide useful information on the role of Terbufos in aquatic incidents. Detection of Terbufos metabolites but not parent Terbufos in the Philbeck pond provides further support for that conclusion.

The incidents illustrate how ecological damage caused by Terbufos can affect the quality of life of individuals. The Philbeck pond was a 2 acre body with large fish. Martha Philbeck reports "We have lost a much used food source, we lost recreational facilities for a whole summer. What if the neighbor kids would have gone swimming like they usually do and would have had serious problems ... ?" These incidents also illustrate that, due to the high persistence and mobility of Terbufos residues, ponds may be affected other than on the property of the farmers who actually use the pesticide. The Bright property is not located immediately adjacent to the property where Terbufos was applied, further confirming that in some situations buffers will not prevent incidents. The residue sampling for the Philbeck pond indicates that surface water contamination may occur for weeks following application.

The role of rainfall in causing aquatic incidents. Cyanamid maintains that the record of aquatic incidents demonstrates that a special series of events must occur in order for an incident to occur. However, the level of documentation required to support such a position is not available to the Agency, if such documentation exists. This applies in particular to the role of heavy rainfall. Cyanamid reports, for the majority of FIFRA 6(a)(2) submissions on the fish kills, that "heavy rainfall" preceded the incident. Cyanamid usually indicates a minimum rainfall volume (in inches). Cyanamid does not ordinarily report a time period in which the volume fell. Documentation of these values (e.g., daily records from rain gauges) are not reported by Cyanamid to substantiate the rainfall volumes claimed, and in fact no basis has been provided for the values stated. Therefore, although EFED has previously made use of the rainfall volumes

indicated in Cyanamid in 6(a)(2) reports, at this time we conclude that these rainfall volumes are of questionable value for interpreting Terbufos aquatic incidents.

Indeed, it appears that for the recent incidents in Indiana discussed above, the information available at this time fails to support the descriptions given by Cyanamid. Cyanamid reported in August 1998 an incident in LaFountaine Indiana. Although Cyanamid's report does not identify the owners of the pond, we believe the incident is the Philbeck incident based on details of the description. Cyanamid states that "dead fish were noticed following heavy rainfall of >2 inches." Cyanamid's FIFRA 6(a)(2) report dated September 1998 on the Bright incident states "dead fish noticed following rainfall in excess of 5 inches." The state of Indiana (Office of the Indiana State Chemist and Seed Commissioner) obtained rainfall records from the Indiana Climate Page for two stations located about 30 miles west and northeast of the locations of the incidents. For the station receiving higher rainfall, found in the state report for the Philbeck incident, rainfall approached 2 inches for the entire week preceding the Philbeck incident, without exceeding half an inch on any day of that week. The information available to the Agency allows that incidents may be associated with normal springtime rainfall.

For the current RED chapter, EFED has removed references to rainfall volumes except where associated with a time interval. In place of rainfall volumes, the chapter states only that heavy rainfall was reported to precede the event.

Limitations of risk quotients (particularly terrestrial). Cyanamid presents a scatterplot (developed by the Office of Research and Development) showing no apparent correlation between RQs and mortality in field studies, for 24 field studies and for RQs within a range 1 to 1000. The EFED Terbufos team has not confirmed the data used in the scatterplot. However we do not view the result as unexpected. The graph does not actually relate directly to the primary use of RQs (determination of concern versus no concern) because the chemicals are only those for which RQ concern levels are exceeded. (Of course, field studies would ordinarily be conducted only where concern levels are exceeded.)

We concur with Cyanamid that it is desirable to develop procedures to quantify variability in exposure. However, we suspect that more refined risk assessment procedures will continue to predict poorly the level of mortality in field studies, because of irreducible variability in field conditions, the limited quantity of data collected in field studies, and other limitations of field studies.

We suggest that for Terbufos the dialogue on the limitations of risk quotients has little relevance. EFED suggests that discussion of mitigation strategy would naturally focus on reducing the frequency of aquatic incidents and/or other measures of mitigation effectiveness for adverse aquatic effects. If convincing measures can be put into place for the aquatic effects, it is possible that a significant reduction in terrestrial risk would result simultaneously (depending on the measures adopted). For Terbufos, the terrestrial RQs suggested a concern, and the field information suggests that indeed Terbufos sometimes kills birds in the field.

Avian field studies by Knapton and Mineau. In previous communications, Cyanamid has called the Agency's attention to an important terrestrial field study (by Knapton and Mineau) which had not been incorporated in previous drafts of the RED chapter. Cyanamid has transmitted a copy of the paper by Knapton and Mineau (Ecotoxicology 4:138-145). Based on that study, EFED has removed a statement from the RED chapter stating that terrestrial field studies have consistently demonstrated acute hazard to birds. However, it is important that the limited sensitivity of field studies be kept in mind, as discussed in greater detail in the revised RED chapter.

Additional comments from American Cyanamid.

- 1) With regard to fate/transport properties of Terbufos sulfone and Terbufos sulfoxide, Cyanamid has submitted information on hydrolysis and aerobic aquatic metabolism which has been used by EFED to revise the EECs.
- 2) With regard to the relative attractiveness of different Terbufos formulations to birds (15G versus 20G) the RED chapter as recently revised does not contain hypotheses on that issue.
- 3) Cyanamid takes exception to EFED's description of a terrestrial incident in which Terbufos killed 20 hawks as "particularly severe." However, the arguments given by Cyanamid relate to the frequency (or uniqueness) of the incident rather than to severity. EFED considers the report submitted by Cyanamid (Bennett et al.) to be useful. The report was reviewed by an avian biologist in EFED as well as by the RED team, and material from the report has been incorporated into the RED chapter.

cc Tom Steeger
Edward Fite
James Felkel